PATENT SPECIFICATION (11) 1305359

1305359

DRAWINGS ATTACHED

(21) Application No. 32411/72 (22) Filed 20 Jan. 1970

(62) Divided out of No. 1303792

(44) Complete Specification published 31 Jan. 1973

(51) International Classification H04B 3/20

(52) Index at acceptance

H4J 24G

H4R 11B 11J

(19)

(54) IMPROVEMENTS IN OR RELATING TO ARRANGEMENTS FOR CANCELLING FEEDBACK

(71) I, SAAD ZAGHLOUL MOHAMED GABR, of MET Limited, 4 Station Road West, Canterbury, Kent, of Moroccan Nationality do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to electrical arrangements for cancelling feedback between two electro-acoustic transducers in a station for a two-way communication system.

As stated in Application 6009/69 (Serial No. 1,270,431), when a loudspeaker and a microphone are operated in proximity to one another, acoustic feedback from the loudspeaker to the microphone takes place. Such feedback is due to sound conduction through the means by which the two transducers are housed or mounted but most is caused by radiation of sound from the loudspeaker to the microphone either directly or by reflection.

Application 6009/69 discloses and claims an electro-acoustic transducer apparatus by which feedback due to directly radiated sound is reduced or eliminated, by acoustic means. It is in some instances desirable to provide for electrical cancellation of feedback either instead of or to supplement such acoustic means.

Accordingly, this invention provides a loudspeaking station for a two-way communication system, the station having a first and a second electro-acoustic transducer, the second transducer having an amplifier associated therewith terminal means for connecting the station into the communication system, circuit means providing first and second channels connecting the first and second transducers respectively to the terminal means and a network arranged to receive a part of an electric signal in the first channel, including means for selectively variably modifying the part, and to combine with the signal between the amplifier and the second transducer signal a modified form of the part such as to tend to cancel any components of a signal in the second channel dependent upon the signal in the first channel.

The station of the invention preferably includes an electro-acoustic transducer as described and claimed in Application 2,736/70 (Serial No. 1303792), from which the present Application was divided.

The invention will be more readily understood from the following description of embodiments thereof taken in conjunction with the accompanying drawing, in which:

Figure 1 is a circuit diagram of an arrangement for electrical suppression of feedback in the loudspeaker; and

Figure 2 is a circuit diagram showing a modification of the arrangement of Figure 1.

In Figures 1 and 2, like parts are indicated by the same reference numerals.

Both the circuits of Figures 1 and 2 include a transducer arrangement which can incorporate a transducer apparatus as described and claimed in Application 2,736/70 (Serial No. 1303792), or which can comprise transducer apparatus as described and claimed in Application 6009/69 (Serial No. 1270431). This transducer arrangement comprises a microphone 10 and a loudspeaker 11. Both the microphone and the loudspeaker are schematically represented in the drawing.

Referring now to Figure 1, it will be seen that the loudspeaker 11 has two speech coils 12, 14. The microphone 10 and the loudspeaker reproduction coil 12 are connected through respective amplifiers 15, 16 to a hybrid 18 and thus to a line terminal 19. The hybrid 18 enables the station to be connected to a two-wire transmission system but may be omitted if a three or four line transmission system is employed.

In Figure 1, part of the output of the transmission amplifier 15 is taken on a line 20 through an adjustable resistor 21 to the coil 14, the transmission signal cancellation coil, of the loudspeaker. The line 20 also

[*Price 25p*]

extends through a phase adjuster 22 which may instead be in either of the alternative positions indicated at 22a and 22b. When there is a sound input to the microphone, part of the resultant signal reaches each of the coils 12, 14 through the hybrid and/or through coupling between the lines caused by the other station or stations. In order to remove this a part of the signal is fed through the line 20 and the circuit components 21 and 22 such that these signals are equal and 180° out of phase. There is thus no sound output corresponding to the microphone signals from the loudspeaker. Feedback to the microphone during operation of the loudspeaker is prevented from affecting the loudspeaker sound output in an exactly similar way.

In Figure 2, an amplifier 24, preferably of variable gain, is included in the line 20 together with an adjustable phase shifter 25 which can instead be placed at the position indicated by 25a. The operation of the circuit is essentially the same as that of Figure 1 except that the amplifier 24 is provided to ensure that the signal applied to the coil 14 is of adequate strength. Also, the loudspeaker 11 has only a single speech coil 26 connected with the secondary winding 28 of a transformer having primary windings 29, 30 performing the functions of the coils 12, 14 of the loudspeaker of Figure 1.

It will be evident that the circuits of Figures 1 and 2, primarily intended for a loudspeaking telephone, can be readily adapted to systems using two pairs of wires for transmission, as for an intercommunication or public address system, the hybrid being not then required. The feedback cancellation network then functions to cancel acoustic feedback between the microphone and loudspeaker. In both illustrated circuits, cancellation takes place at the loudspeaker but it is equally within the invention to arranged for cancellation at the microphone, either in addition or as an alternative.

The arrangements herein described will thus be seen to provide convenient means for reducing, by electrical cancellation, feedback between electro-acoustic transducers.

WHAT I CLAIM IS:—

1. A loud speaking station for a two-way communication system, the station having a first and a second electro-acoustic transducer, the second transducer having an amplifier associated therewith, terminal means for connecting the station into the communication system, circuit means providing first and second channels connecting the first and second transducers respectively to the terminal means and a network arranged to receive a part of an electric signal in the first channel, including means for selectively variably modifying the part, and to combine with the signal between the amplifier and the second transducer a modified form of the part such as to tend to cancel any components of a signal in the second channel dependent upon the signal in the first channel.

2. A station as claimed in claim 1, including a hybrid positioned in the first and second channels whereby the station may be connected in a two-wire communication system.

3. A station as claimed in claim 1 or 2, in which the modifying means comprises a resistor and a phase adjuster, one or both of which is selectively variable.

4. A station as claimed in claim 1, 2 or 3, in which the network includes an amplifier.

5. A station as claimed in claim 4, in which the amplifier is a variable gain amplifier.

6. A station as claimed in any preceding claim, in which the modified form of the signal is applied to one of a pair of speech coils of the second transducer, the amplifier to transducer signal being applied to the other.

7. A station as claimed in any one of claims 1 to 5, having a transformer connected to the second transducer, the transformer having two windings, the modified form of the signal being applied to one of the windings and the amplifier to transducer signal to the other.

8. A station as claimed in any preceding claim in which the first transducer is a microphone and the second transducer is a loudspeaker.

9. A station for a two-way communication system substantially as herein described with reference to Figure 1 or Figure 2 of the accompanying drawings.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1973.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1305359 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale

FIG.1.

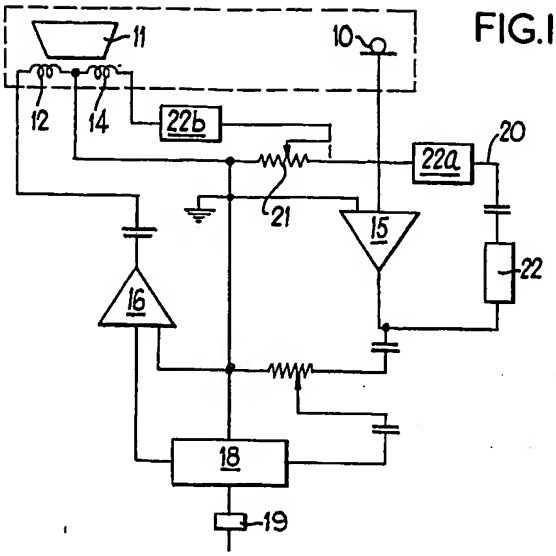

FIG.2.